

## **E.2. EMERGENCY AND REMEDIAL RESPONSE PLAN**

40 CFR 146.94(a)

### **Facility Information**

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[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

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## 1. Overview

[REDACTED]

### *Background*

[REDACTED]

### *Identification of Potential Emergency Events*

[REDACTED]

[REDACTED]

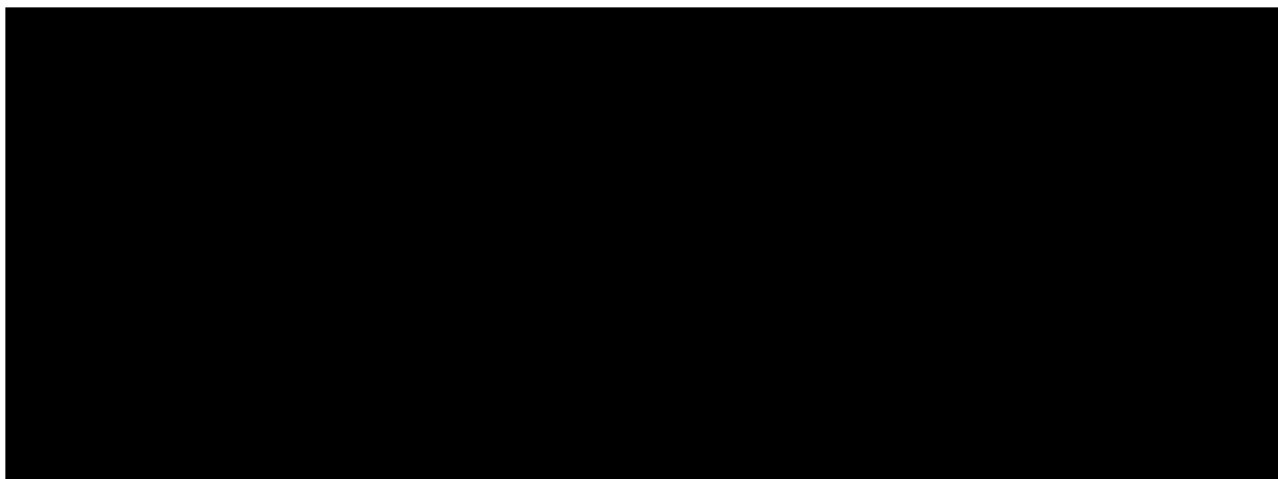
[REDACTED]

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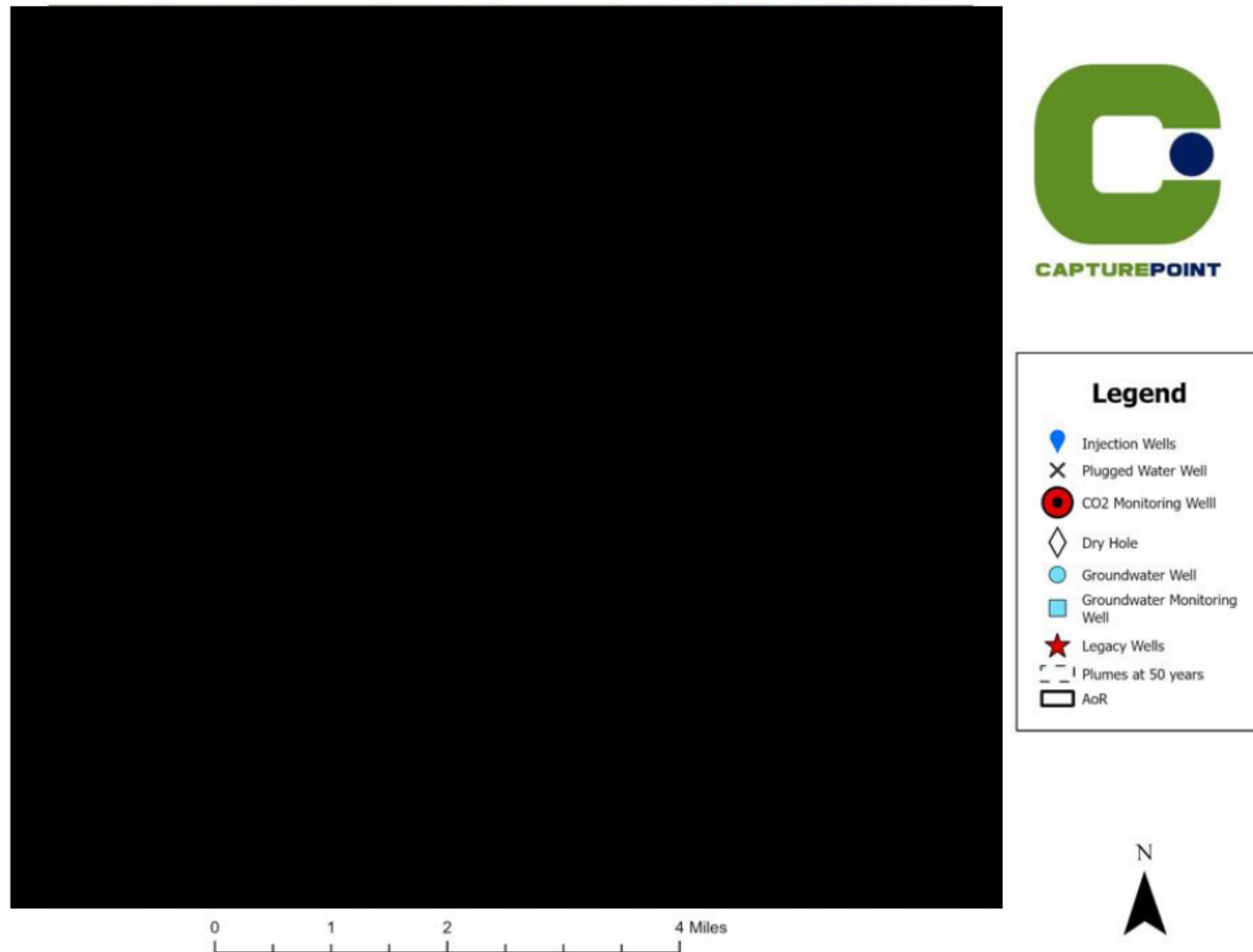
### 1.1 Local Resources and Infrastructure

[REDACTED]

**Table 1 USDWs and Surface Water**



**Figure 1. Map of Site Resources and Infrastructure**



## 1.2 Potential Risk Scenarios



**Table 2 Degrees of Risk for Emergency Events.**

Emergency Condition	Definition
Major emergency	Event poses immediate substantial risk to human health, resources, or infrastructure. Emergency actions involving local authorities (evacuation or isolation of areas) should be initiated.
Serious emergency	Event poses potential serious (or significant) near term risk to human health, resources, or infrastructure if conditions worsen or no response actions taken.
Minor emergency	Event poses no immediate risk to human health, resources, or infrastructure.

## 2. Emergency Identification and Response Actions



**Table 3 Potential Project Emergency Events, Impact, Risk and Detection**

Potential Emergency Events	Location	Phase	Impact Severity	Risk Likelihood	Detection
E.1. Movement of brine during drilling	Wellbore	C	Serious	Low	Loss of circulation while drilling
E.2. Well Control Event	Well	C	Serious	Low	Unexpected changes in well fluid levels occur while drilling
E.3. Failure of CO <sub>2</sub> flow lines from capture to wellhead	Surface facilities	I	Minor	Moderate	Monitoring detects CO <sub>2</sub> leak

Potential Emergency Events	Location	Phase	Impact Severity	Risk Likelihood	Detection
E.4. Monitoring equipment failure	Wellhead	I	Low	Moderate	Failure of monitoring equipment for wellhead pressure, temperature and or annulus pressure is detected
E.5. Injection Well Integrity Failure	E.4.a Tubing and or packer failure	I	Moderate	Low	Monitoring detects changes in pressure and temperature
	E.4.b Casing failure	I	Serious	Low	Changes in annulus fluid level is detected
E.6. Monitoring Well Integrity Failure	E.5.a Casing failure	I, PI	Serious	Low	Changes in annulus fluid level is detected
E.7. Potential brine or CO <sub>2</sub> leakage to USDW	AoR	I, PI	Serious	Unlikely	Elevated concentrations of indicator parameters in soil, groundwater or surface water samples are detected
E.8. Storage reservoir unable to contain the formation fluid or stored CO <sub>2</sub>	AoR	I, PI	Serious	Unlikely	Elevated concentrations of indicator parameters in soil, groundwater or surface water samples are detected
E.9. Induced seismicity	AoR	I	Moderate	Low	Seismic readings are detected that exceed predefined limits
E.10. Other natural disaster	AoR	I, PI	Low	Low	

Note: C = Construction Period, I = Injection Phase and PI = Post Injection Period

### ***E.1. Movement of Brine During Drilling***

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

### ***E.2. Well Control Event***

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4. [REDACTED]

[REDACTED]

[REDACTED]

### *E.3. Failure of CO<sub>2</sub> Flow Lines from Capture to Wellhead*

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

### *E.4. Monitoring Equipment Failure*

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3.

### *E.5. Injection Well Integrity Failure*

*E.5.a. Tubing and Packer:*

*E.5.b. Casing:*

1

Response actions in the event of tubing, packer or casing failure:

#### ***E.6. Monitoring Well Integrity Failure***

##### ***E.6.a. Tubing and Packer:***

##### ***E.6.b. Casing:***

***E.7. Potential Brine or CO<sub>2</sub> Leakage to USDW***

Elevated concentrations of indicator parameter(s) in groundwater sample(s) or other evidence of

[REDACTED]

***E.7.a. Vertical Migration via Injection Wells***

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

***E.7.b. Vertical Migration via Monitoring Wells***

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### E.7.c. Vertical Migration via legacy and P&A Wells

\_\_\_\_\_

\_\_\_\_\_

#### E.7.d. Vertical Migration due to Failure of the Confining Layer

[REDACTED]

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- [illegible]

11 [REDACTED]

#### ***E.8 Lateral Migration of CO<sub>2</sub> outside of AoR***

[REDACTED]

[REDACTED]

[REDACTED]

- 1 [REDACTED]
- 2 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### *E.9. Storage Reservoir unable to Contain the Formation Fluid or Stored CO<sub>2</sub>*

[REDACTED]

[REDACTED]

#### *E.10. Induced Seismicity*

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### *E.11. Other Natural Disaster*

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

**Table 4 Operational Shutdown Procedures**

Severity	Well Integrity Failure	Monitoring Equipment Failure	Potential Brine or CO <sub>2</sub> Leakage to USDW	Natural Disaster
<b>All Emergency Events</b>	Shut-In Well (Close Flow Valve) Vent CO <sub>2</sub> from Surface Facilities			
<b>Major Impact Events</b>	Limit access to wellhead to authorized personnel only  Communicate with CapturePoint Solutions and local authorities to initiate evacuation plans, as necessary  Monitor well pressure, temperature and annulus pressure to verify integrity loss and determine the cause and extent of failure, identify and implement appropriate remedial actions to repair the well (in consultation with the UIC Program Director)	Limit access to wellhead to authorized personnel only  Communicate with CapturePoint Solutions and local authorities to initiate evacuation plans, as necessary  Monitor well pressure, temperature and annulus pressure (manually if necessary) to determine the cause and extent of failure  Identify and, if necessary, implement appropriate remedial actions (in consultation	Collect confirmation sample(s) of groundwater and analyze for indicator parameters (potential indicators are listed in Tables 6.5, 6.6, 6.7 and 6.8 in the Testing and Monitoring Plan.  If the presence of indicator parameters is confirmed, develop (in consultation with the UIC Program Director) a case specific plan to: <ol style="list-style-type: none"> <li>1. Install additional groundwater monitoring points near the impacted groundwater well(s) to delineate the extent of impact</li> <li>2. Remediate unacceptable impacts to the USDW</li> </ol>	Limit access to wellhead to authorized personnel only  Communicate with CapturePoint Solutions and local authorities to initiate evacuation plans, as necessary  Monitor well pressure, temperature and annulus pressure to verify well status and determine the cause and extent of any failure  Determine if any leaks to groundwater or surface water occurred  If contamination or endangerment is detected, identify and implement

Severity	Well Integrity Failure	Monitoring Equipment Failure	Potential Brine or CO <sub>2</sub> Leakage to USDW	Natural Disaster
	If contamination is detected, identify and implement appropriate remedial actions (in consultation with the UIC Program Director)	with the UIC Program Director)  Identify impacts	<ol style="list-style-type: none"> <li>3. Arrange for an alternate source of potable water supply, if the USDW was being utilized and has been caused to exceed drinking water standards</li> <li>4. Continue groundwater remediation and monitoring on a frequent basis (frequency to be determined by CapturePoint Solutions and the UIC Program Director) until the adverse USDW impact has been fully addressed</li> </ol>	appropriate remedial actions (in consultation with the UIC Program Director)

Severity	Well Integrity Failure	Monitoring Equipment Failure	Potential Brine or CO <sub>2</sub> Leakage to USDW	Natural Disaster
<b>Minor Impact Events</b>	Reset automatic shutdown devices  Monitor well pressure, temperature and annulus pressure to verify integrity loss and determine the cause and extent of failure, identify and implement appropriate remedial actions to repair the well (in consultation with the UIC Program Director)	Reset automatic shutdown devices  Monitor pressure, temperature and annulus pressure (manually if necessary) to determine the cause and extent of failure  Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director)		Limit access to wellhead to authorized personnel only  Monitor well pressure, temperature and annulus pressure to verify integrity loss and determine the cause and extent of any failure  Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director)

**Table 5 Seismic monitoring system, for seismic events > M1.0 with an epicenter within an 7 mile radius of the injection well.**

Operating State	Threshold Condition <sup>1,2</sup>	Response Action <sup>3</sup>
Green	Seismic events less than or equal to M1.5	1. Continue normal operation within permitted levels.
Yellow	Five (5) or more seismic events within a 30 day period having a magnitude greater than M1.5 but less than or equal to M2.0	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well.
Orange	Seismic event greater than M1.5 and local observation or felt report	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well.
	Seismic event greater than M2.0 and no felt report	3. Review seismic and operational data. 4. Report findings to the UIC Program Director and issue corrective actions.
Magenta	Seismic event greater than M2.0 and local observation or report	1. Initiate rate reduction plan. 2. Vent surplus CO <sub>2</sub> from surface facilities 3. Limit access to the wellhead to authorized personnel only 4. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well. 5. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary. 6. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director). 7. Determine if leaks to ground water or surface water occurred. 8. If USDW contamination is detected: a. Notify the UIC Program Director within 24 hours of the determination. b. Initiate shut down plan (See table 4) 9. Review seismic and operational data. 10. Report findings to the UIC Program Director and issue corrective actions.

<sup>1</sup> Specified magnitudes refer to magnitudes determined by USGS seismic monitoring stations or reported by the USGS National Earthquake Information Center using the national seismic network.

<sup>2</sup> “Felt report” and “local observation and report” refer to events confirmed by local reports of felt ground motion or reported on the USGS “Did You Feel It?” reporting system.

<sup>3</sup> Reporting findings to the UIC Program Director and issuing corrective action will occur within 25 business days (five weeks) of change in operating state.

Operating State	Threshold Condition <sup>1,2</sup>	Response Action <sup>3</sup>
<b>Red</b>	Seismic event greater than M2.0, and local observation or report, and local report and confirmation of damage <sup>4</sup>	<ol style="list-style-type: none"> <li>1. Initiate shutdown plan. (See table 4)</li> <li>2. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well.</li> <li>3. Limit access to the wellhead to authorized personnel only</li> <li>4. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary.</li> <li>5. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director).</li> <li>6. Determine if leaks to ground water or surface water occurred.</li> <li>7. If USDW contamination is detected: <ol style="list-style-type: none"> <li>a. Notify the UIC Program Director within 24 hours of the determination.</li> <li>b. Identify and implement appropriate remedial actions (in consultation with the UIC Program Director)</li> </ol> </li> <li>8. Review seismic and operational data.</li> <li>9. Report findings to the UIC Program Director and issue corrective actions.</li> </ol>
	Seismic event >M3.5	

<sup>4</sup> Onset of damage is defined as cosmetic damage to structures, such as bricks dislodged from chimneys and parapet walls, broken windows, and fallen objects from walls, shelves, and cabinets.

### 3. Response Personnel and Equipment

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

**Table 6 Contact Information for Key Local, State, and other Authorities.**

[REDACTED]
------------

[REDACTED]

[REDACTED]

#### 3.1 Emergency Communications Plan

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

### 3.2 Plan Review

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

### 3.3 Staff Training and Exercise Procedures

[REDACTED]



**Table 7 Summary Table for Risks, Monitoring and Response Actions**

<b>Risk</b>	<b>Description</b>	<b>Monitoring</b>	<b>Controls</b>	<b>Response Actions</b>	<b>Responsible Personnel</b>
Movement of brine between zones while drilling	The occurrence of crossflow or loss into a USDW while drilling	<ul style="list-style-type: none"> <li>• Tank level sensor</li> <li>• Pressure sensor</li> <li>• Flow Sensors</li> <li>• Mud weight</li> </ul>	Surface casing set below USDW Casing integrity test	Stop drilling Check well fluid levels to determine loss or influx If loss is detected control the well	Rig personnel Site Superintendent
Well control event while drilling	The potential for pressure buildup downhole resulting in loss of fluid level control in the well		BOP equipment Kill fluid Well control training BOP testing protocol	Stop drilling Close BOP Clear drilling floor and secure area Execute well control procedures Evaluate drilling parameters to identify cause	Rig personnel Site superintendent Plant Manager
Failure of flow lines from capture to wellhead	Leak occurring in piping as a result of physical damage or corrosion	Routine inspections by project personnel DAS/DTS fiber optic cable along flow line Pressure gauges <ul style="list-style-type: none"> <li>• Temperature sensors</li> <li>• Flow meters</li> <li>• Automatic alarms</li> </ul>		Shut off flow and isolate leak Make repairs Assess loss of volumes Evaluate and implement procedures to prevent future occurrences	Site personnel Site superintendent

Risk	Description	Monitoring	Controls	Response Actions	Responsible Personnel
		<ul style="list-style-type: none"> <li>(See Section E.3.)</li> </ul>			
Monitoring equipment failure	Mechanical or electrical failure of gauges or sensors at the wellhead or along the flow lines	<ul style="list-style-type: none"> <li>Automatic alarms</li> <li>Routine inspection and calibration</li> </ul>			
Mechanical Integrity failure of well	Failure of the tubing, packer or casing that allows fluid across zones and into a USDW	<ul style="list-style-type: none"> <li>Automatic alarms</li> <li>Pressure gauges</li> <li>Temperature sensors</li> <li>Flow meters</li> </ul>			Site personnel Site superintendent Plant Manager Remediation contractors
Potential Brine or CO <sub>2</sub> leakage to USDW	Potential migration of brine or stored CO <sub>2</sub> along conduits such as well penetrations or through faults or fractures in the confining layer	<ul style="list-style-type: none"> <li>Above confining zone monitoring</li> <li>Groundwater monitoring</li> <li>Soil gas probes</li> <li>(see section 6.1 table 6.1 item T.8, T.9 and T.10 in the Testing and monitoring plan)</li> </ul>			
Storage Reservoir Unable to Contain the Formation Fluid or Stored CO <sub>2</sub>	Failure of the confining layer as the result of faulting or fracturing or the presence of previously unknown faults and fractures in the confining layer				Site personnel Site superintendent Plant Manager Remediation contractors

<b>Risk</b>	<b>Description</b>	<b>Monitoring</b>	<b>Controls</b>	<b>Response Actions</b>	<b>Responsible Personnel</b>
Lateral Migration of brine and or CO <sub>2</sub> outside of the AoR			<ul style="list-style-type: none"> <li>Detailed geologic model with stratigraphic wells as control</li> <li>Geophysical survey</li> <li>AoR review and calibration every 5 years</li> <li>Monitoring until plume stabilization occurs</li> </ul>	See section E.7.e	
Induced Seismicity	As a result of injection pressure exceeding the fracture gradient of the system causing ground movement compensation	<ul style="list-style-type: none"> <li>Pressure guages</li> <li>Temperature sensors</li> <li>Flow meters</li> <li>(see table 4)</li> </ul>	<ul style="list-style-type: none"> <li>Injection rate and volume control limits</li> <li>Pressure and temperature limits</li> </ul>	Stop injection Vent CO <sub>2</sub> from surface facilities	Site personnel Site superintendent Plant Manager Remediation contractors
Other Natural Disaster	Natural seismicity, weather events, or physical impact and damage to flow lines or wellhead	N/A	Stop injection	Stop injection Vent CO <sub>2</sub> from surface facilities	